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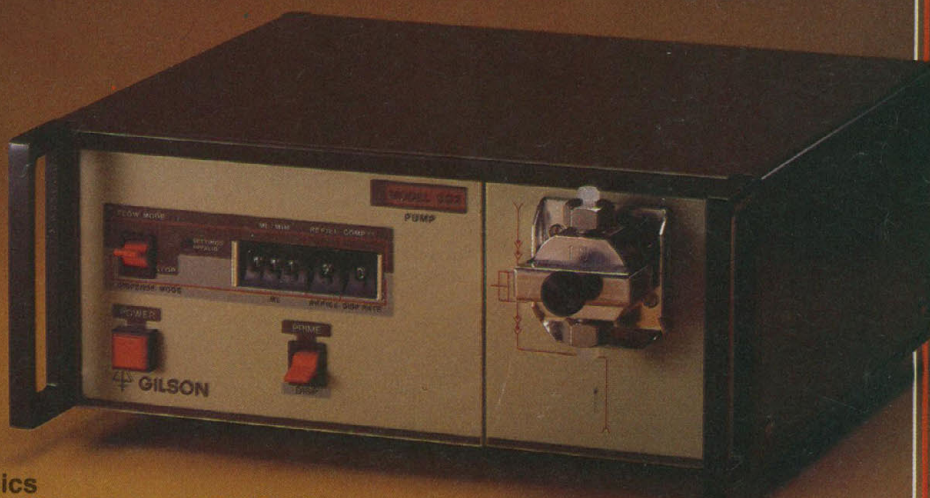
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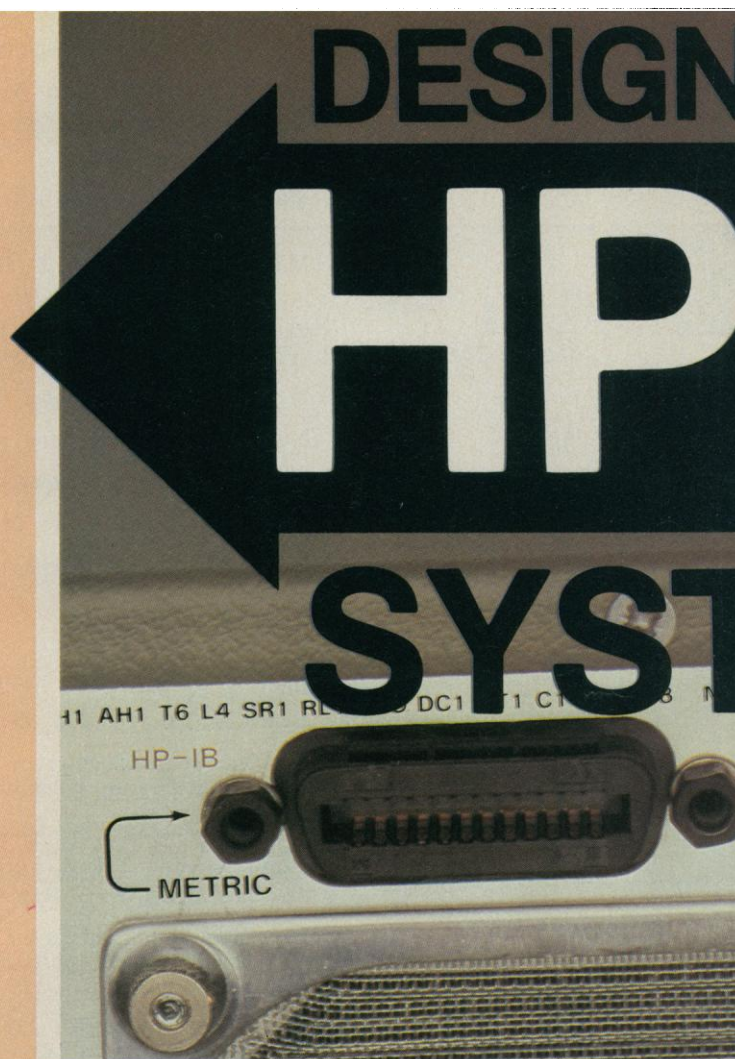
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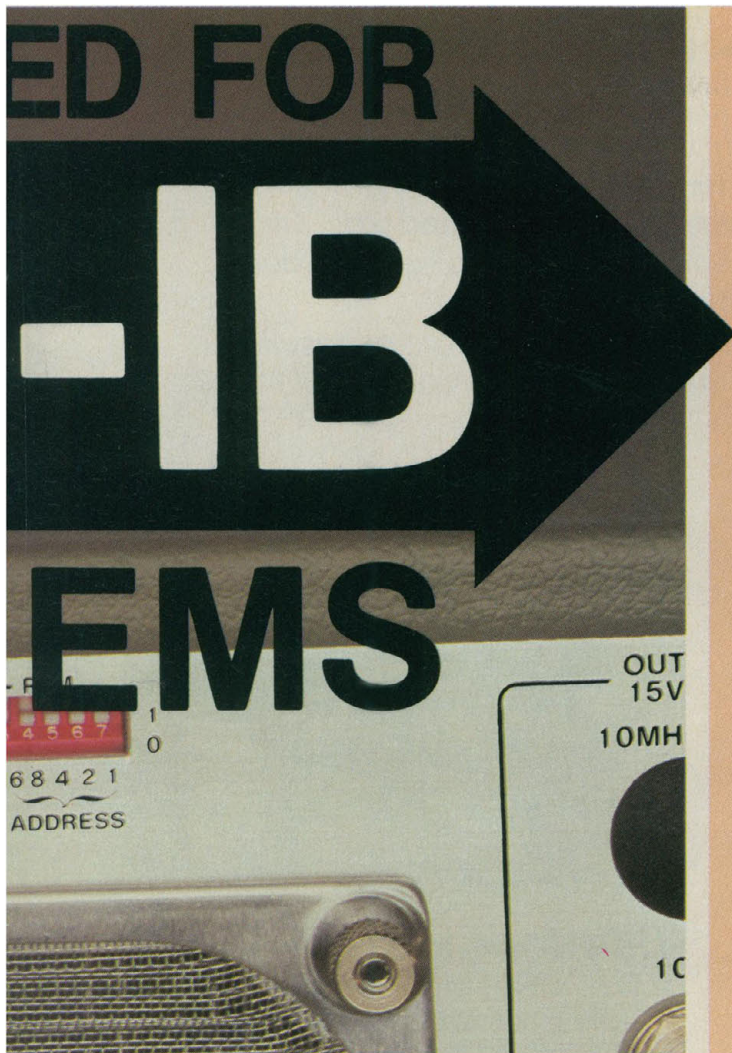
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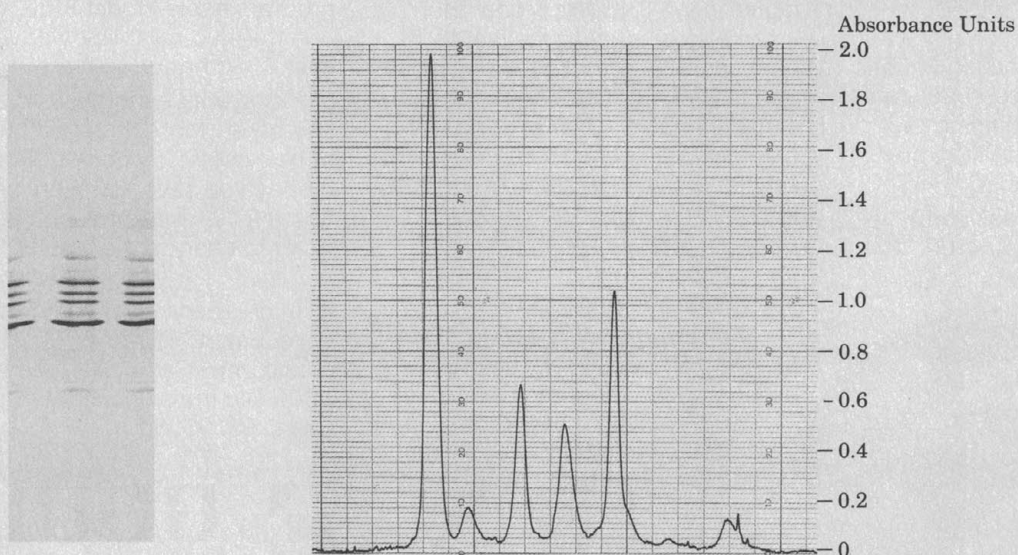
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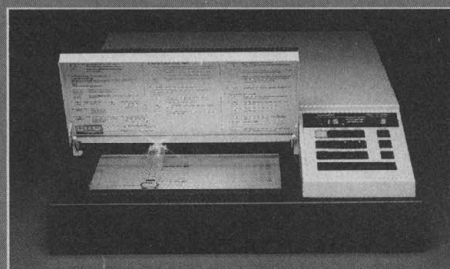
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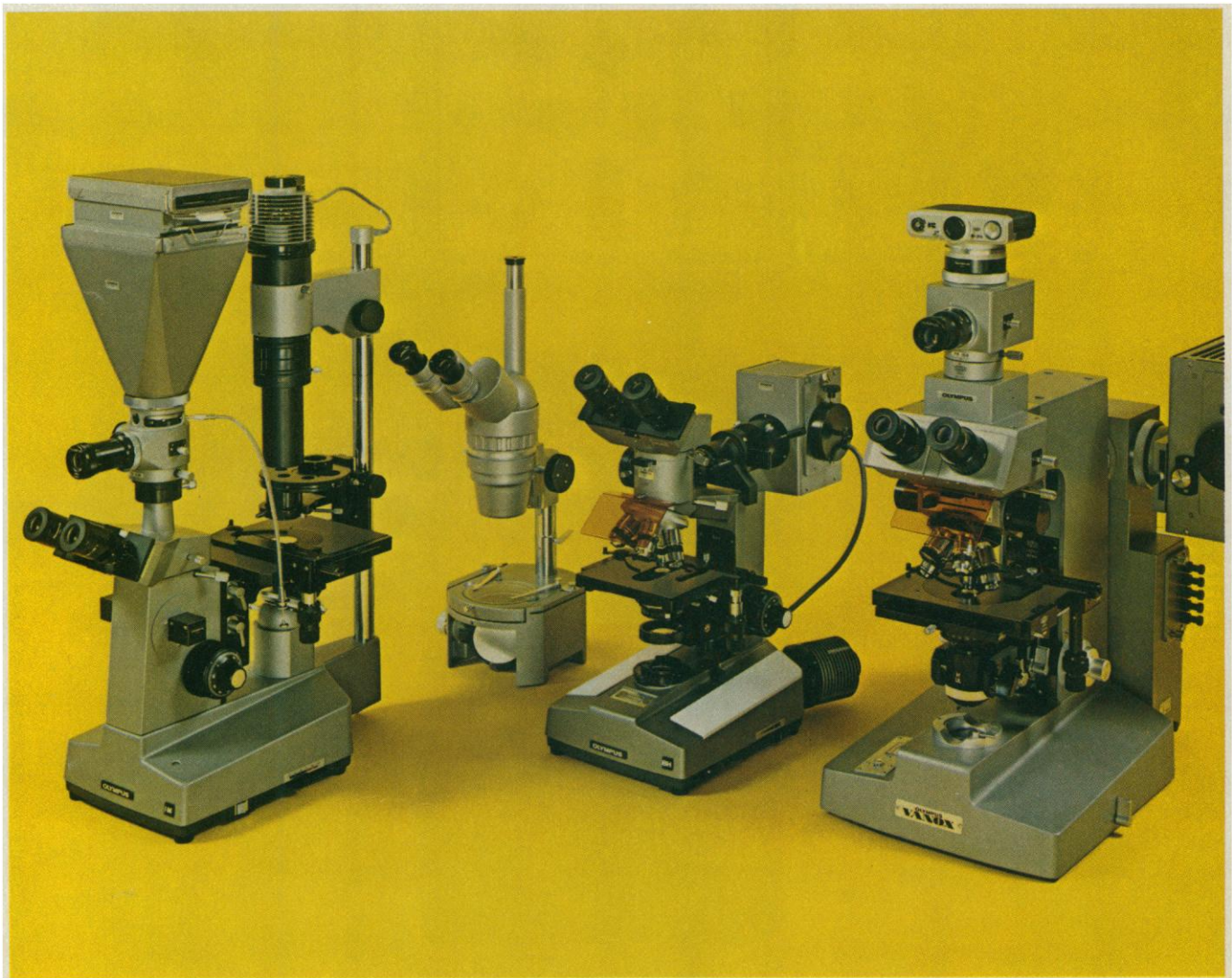
edited by **J.M. Lyons**, **R.C. Valentine, D.A.**

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University of California, Davis

Focuses on enhancing the efficiency of symbiotic nitrogen fixation. Bridges the gap between the rhizobial microsymbiont and its host, emphasizing the fundamental biology of the symbiosis. *Basic Life Sciences, Volume 17*. approx. 675 pp., illus., 1981, \$69.50

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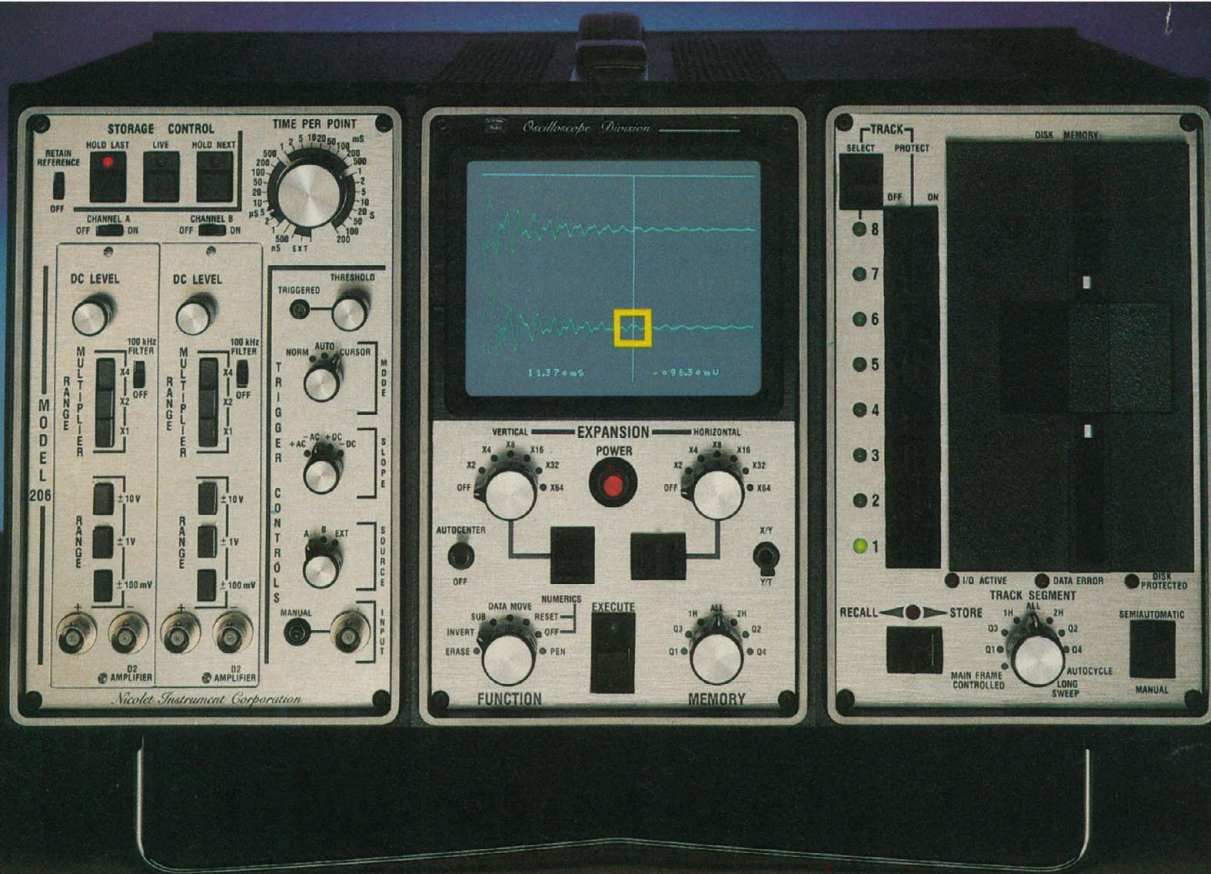
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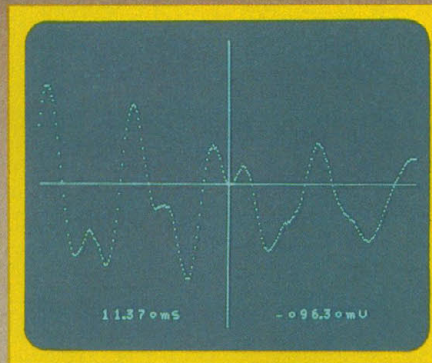
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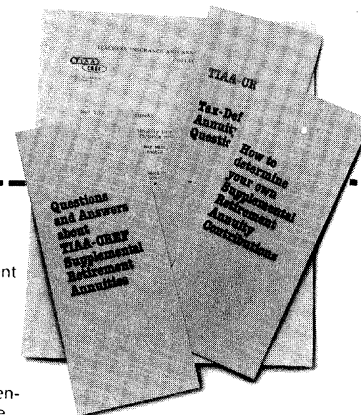
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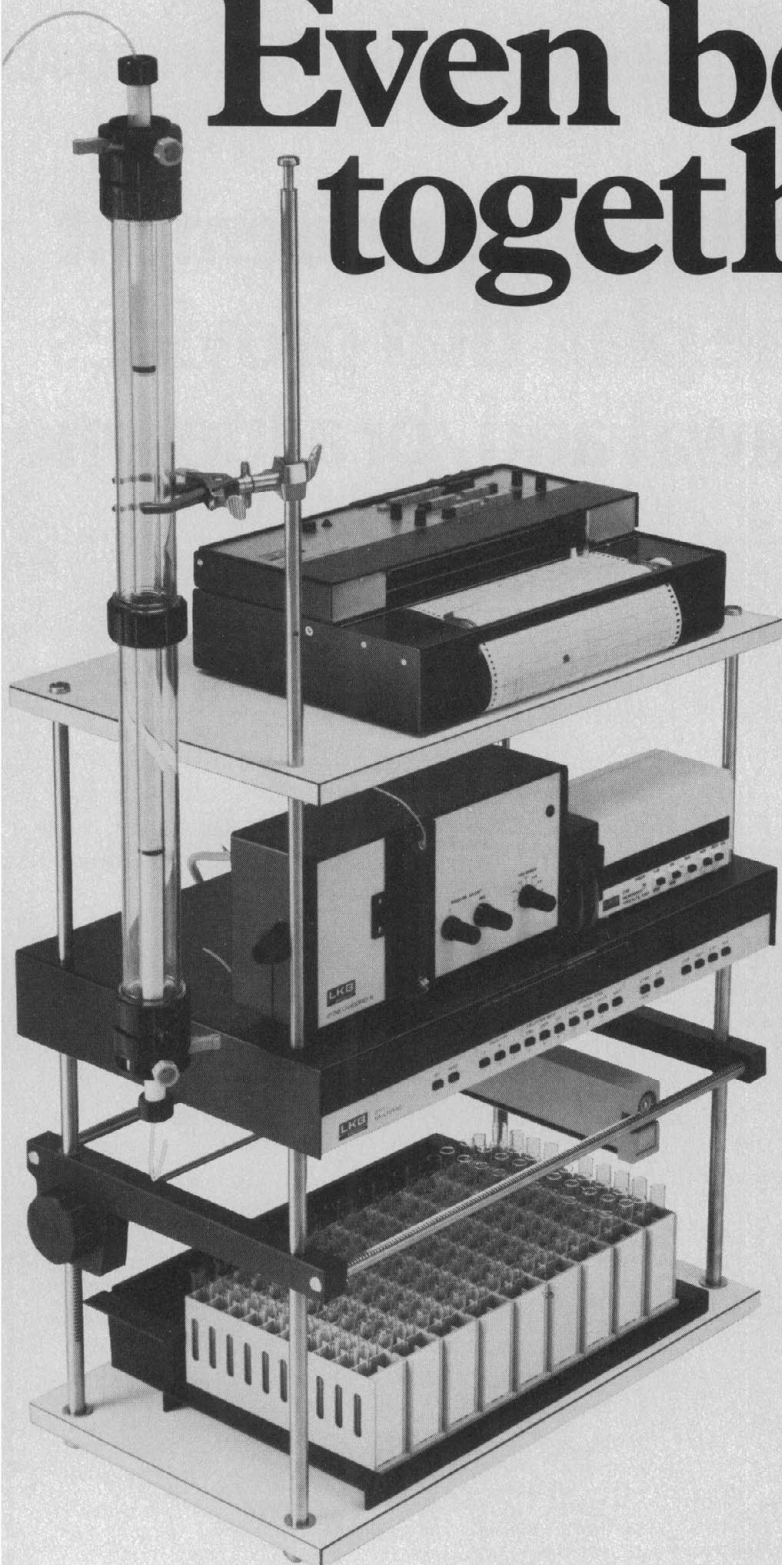
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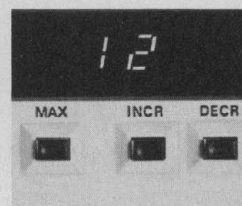
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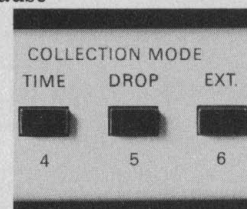
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WB-4101 (2,6-Dimethoxyphenoxyethyl)
aminomethyl-1, 4-benzodioxane,
2-[*phenoxy*-3-³H(N)]-
Epinephrine, *levo*-[*methyl*-³H]-
Norepinephrine, *levo*-[7,8-³H(N)]-

β -Adrenergic

Carazolol, DL-[3,6-³H(N)]-
Dihydroalprenolol hydrochloride, *levo*-
[*propyl*-2,3-³H]-
Epinephrine, *levo*-[*N-methyl*-³H]-
Hydroxybenzylisoproterenol, *p*-[7-³H]-
Isodihydroxybenzylpindolol, [1²⁵]-
Isoproterenol, DL-[7-³H(N)]-
Norepinephrine, *levo*-[7,8-³H(N)]-
Propranolol, L-[4-³H]-

Aspartate

Aspartic acid, D-[2,3-³H]-
Aspartic acid, L-[2,3-³H]-
Methyl-D-aspartic acid, *N*-[*methyl*-³H]-

Benzodiazepine

Diazepam, [*methyl*-³H]-
Flunitrazepam, [*methyl*-³H]-

Cholinergic

Muscarinic

Acetylcholine chloride, [*N-methyl*-³H]-
Choline chloride, [*methyl*-³H]-
Pilocarpine, [³H(G)]-
Scopolamine methyl chloride,
[*N-methyl*-³H]-

Nicotinic

Acetylcholine chloride, [*N-methyl*-³H]-
 α -Bungarotoxin, [1²⁵]-
Choline chloride, [*methyl*-³H]-
Tubocurarine chloride, *dextro*-[13'-³H(N)]-

Dopaminergic

ADTN Amino-6,7-dihydroxy-
1,2,3,4-tetrahydronaphthalene,
2-[5,8-³H]-
Amphetamine sulfate, D-[³H(G)]-
Apomorphine, [8,9-³H]-
Chlorpromazine, [³H]-
Dihydroxyphenylethylamine,
3,4-[*ethyl*-1-³H(N)]- or [*ethyl*-2-³H(N)]-
Haloperidol, [³H(G)]-
Propylorapomorphine, *N*-[*propyl*-³H(N)]-
Spiroperidol, [1-*phenyl*-4-³H]-

GABA

Alanine, β -[3-³H(N)]-
Aminobutyric acid, γ -[2,3-³H(N)]-
Dihydropicrotoxinin, α -[8,10-³H]-
Isoguvacine hydrochloride, [³H]-
Muscimol, [*methylene*-³H(N)]- or [4-³H]-
Nipicotic acid, [*ring*-³H]-

Glutamate

Glutamic acid, L-[3,4-³H]-

Glycine

Glycine, [2-³H]-

of labeled ligands

Histamine

H₁

Histamine, [³H(G)]-
Pyrilamine, [*pyridinyl*-5-³H]- (Mepyramine)

H₂

Histamine, [³H(G)]-

Opiate

Dihydromorphine, [7,8-³H(N)]-
Enkephalin (5-L-leucine), [*tyrosyl*-3,5-³H(N)]-
Enkephalin (5-L-methionine),
[*tyrosyl*-3,5-³H(N)]-
Enkephalinamide
(2-D-alanine-5-L-methionine),
[*tyrosyl-ring*-2,6-³H]-
Ethylketocyclazocine, [9-³H]-
Morphine, [6-³H(N)]-

Serotonin

Hydroxytryptamine binoxalate, 5-[1,2-³H(N)]-
Hydroxytryptamine creatinine sulfate,
5-[1,2-³H(N)]-

Steroid

Androgen

Dihydrotestosterone,
[1,2,4,5,6,7,16,17-³H(N)]-
Methyltrienolone, [17 α -*methyl*-³H]- (R1881)*
Testosterone, [1,2,6,7,16,17-³H(N)]-

Estrogen

Estradiol, [2,4,6,7,16,17-³H(N)]-
Iodo-3, 17 β -estradiol, 16 α -[1²⁵]-
Moxestrol, [11 β -*methoxy*-³H]- (R2858)*

Glucocorticoid

Dexamethasone, [6,7-³H(N)]-
Prednisolone, [6,7-³H(N)]-
Triamcinolone acetonide, [6,7-³H(N)]-

Mineralocorticoid

Aldosterone, D-[1,2,6,7-³H(N)]-

Progesterone

Dihydroprogesterone, [1,2-³H(N)]-
Nor-17 α -ethynyltestosterone, 19-[6,7-³H(N)]-
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Phencyclidine, [*piperidyl*-3,4-³H(N)]-
Reserpine, [*benzoyl*-³H(G)]-

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New labeled ligands

Aminoclonidine, *p*-[3, 5-³H]-
Dioxolane, L(+)-*cis*-[2-*methyl*-³H]-
Domperidone, [*benzene-ring*-³H]-
Doxepin, [*methyl*-³H]-
Lysergic acid diethylamide,
[*N-methyl*-³H]-
Melanotropin Release Inhibiting
Hormone, [*L-proline*-2, 3, 4, 5-³H]- (MRIH)
Naloxone, [*N-allyl*-2, 3-³H]-
Oxotremorine-M, [*methyl*-³H]-
Oxymorphone hydrochloride,
[*N-methyl*-³H]-
Pargyline, [³H(G)]-
Prazosin, [*furoyl*-5-³H]-
Quinuclidinyl benzilate,
L-[*benzyl*-4,4'-³H(N)]-
SKF 10,047, [*N-allyl*-2, 3-³H]-
Yohimbine, [*methyl*-³H]-

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EULEP Symposium held August 29, 1980, Rotterdam (The Netherlands)

Edited by V. Volf,

Kernforschungszentrum Karlsruhe

Organized by the European Late Effects Project Group (EULEP) and co-sponsored by the Commission of the European Communities, Directorate-General for Research, Science and Education Biology, Radiation Protection and Medical Research, Brussels, Belgium.

European Applied Research Reports Special Topics Series.

Contents include: an outline on bone tumor induction and its significance, and a review on bone cells and on construction and reconstruction of bone. Under the heading of modern methods for studying the detailed uptake of radionuclides in bone, 3 papers have been presented: Cytological Studies of Plutonium; The Spatial Distribution of Plutonium-239 in Bone, the Initial Uptake and its Subsequent Changes and Dosimetry of Alpha-Emitting in Bone. Concerning the quantitative and biological aspects of bone tumor induction by ionizing radiations, 3 further papers deal with bone dose and tumor induction; biological factors as illustrated in work with Strontium-90 and biological factors as illustrated in work with short-lived alpha-emitters.

Spring 1981 160 pp. Dfl 80/\$32.00
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ISSN: 0275-7575

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Edited by H. Kottowski, JRC-Ispira
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The book is addressed to engineers, plant operators and technicians involved in the operation of LMFBs and test facilities, to members of advisory and regulatory organizations, and to all those concerned in safety assessment or assurance in sodium handling.

Contents: Chemical Behaviour of Sodium; Sodium Fires Spray and Pool Fires, Fire Fighting; Sodium Aerosol Behaviour in Closed Compartments and in the Open Air; Transport Capability of Sodium for Activated Materials; Impact of Hot Sodium on Clothes; Burning Injuries due to Hot Sodium; First Aid Measures.

Contributors: W. Peppeler — Liquid Metals Division, KFK Karlsruhe (Germany); H. Stamm — KFK, Karlsruhe (Germany); S. Jordan — KFK, Karlsruhe (Germany); V. Prodi — Health Physics Laboratory, C.N.E.N., Rome (Italy); A. L. Nichols — Aerosol Laboratory, UKAEA, Winfrith (United Kingdom); J. F. Van de Vate — Reactor Research Centre, Petten (The Netherlands); J. C. Malet — Aerosol Laboratory, CEA, Cadarache (France); W. Holst — Health and Medicine Division (Ispira); H. Kottowski — Heat Transfer Division (Ispira); C. Savatteri — Heat Transfer Division (Ispira).

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Edited by G. Casini, JRC-Ispira

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3 7186 0062 5

Radiation Protection Quantities for External Exposure

Proceedings of the Symposium held October 13-15, 1980, Braunschweig,

Federal Republic of Germany

Edited by G. Burger (GSF), H. G. Ebert (Commission of the European Communities), D. Harder (Gottingen), R. Kramer (GSF), and S. Wagner (PTB)

Organized by the Commission of the European Communities in collaboration with Physikalisch-Technische Bundesanstalt, PTB Braunschweig Gesellschaft Fur Strahlen-U. Umweltforschung MBH, GSF, Munchen, Institut Fur Medizinische Physik und Biophysik der Universität Gottingen.

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Sponsored by Commissariat a l'Energie Atomique CEN — Cadarache, and United Kingdom Atomic Energy Authority, AERE — Harwell

Editors: K. W. Carley-Macaulay; R. G. Gutman; E. W. Hooper; J. A. Jenkins; A. D. Turner; P. F. Wace; P. Chauvet; J. P. Gauchon; T. Dippel.

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Seventh Symposium on Microdosimetry

Oxford, England,
September 8-12, 1980

Editors: J. Booz, H. G. Ebert and
H. D. Hartfiel

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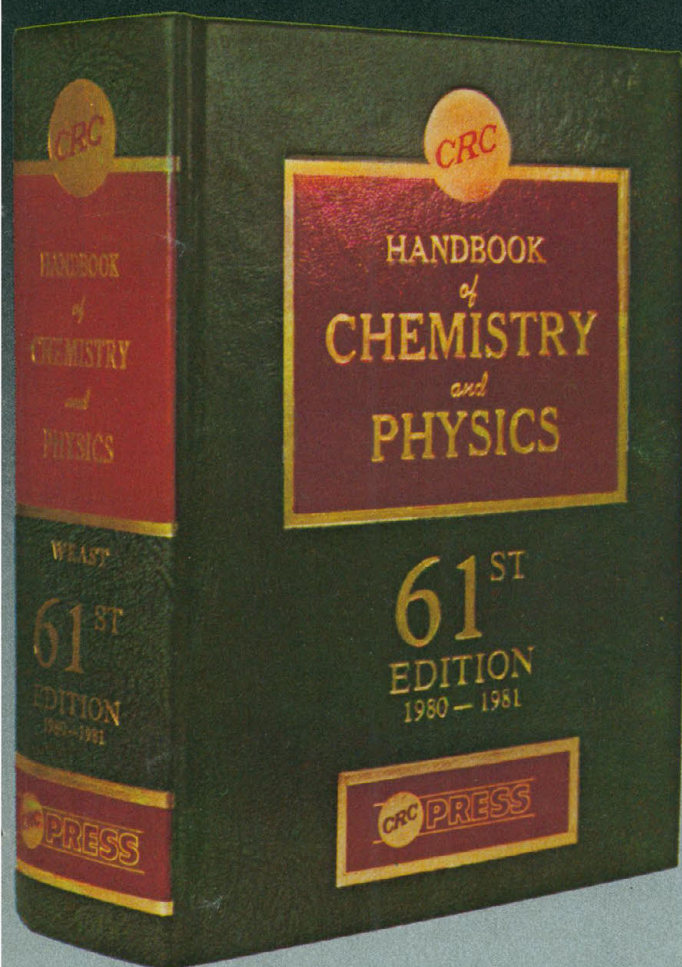
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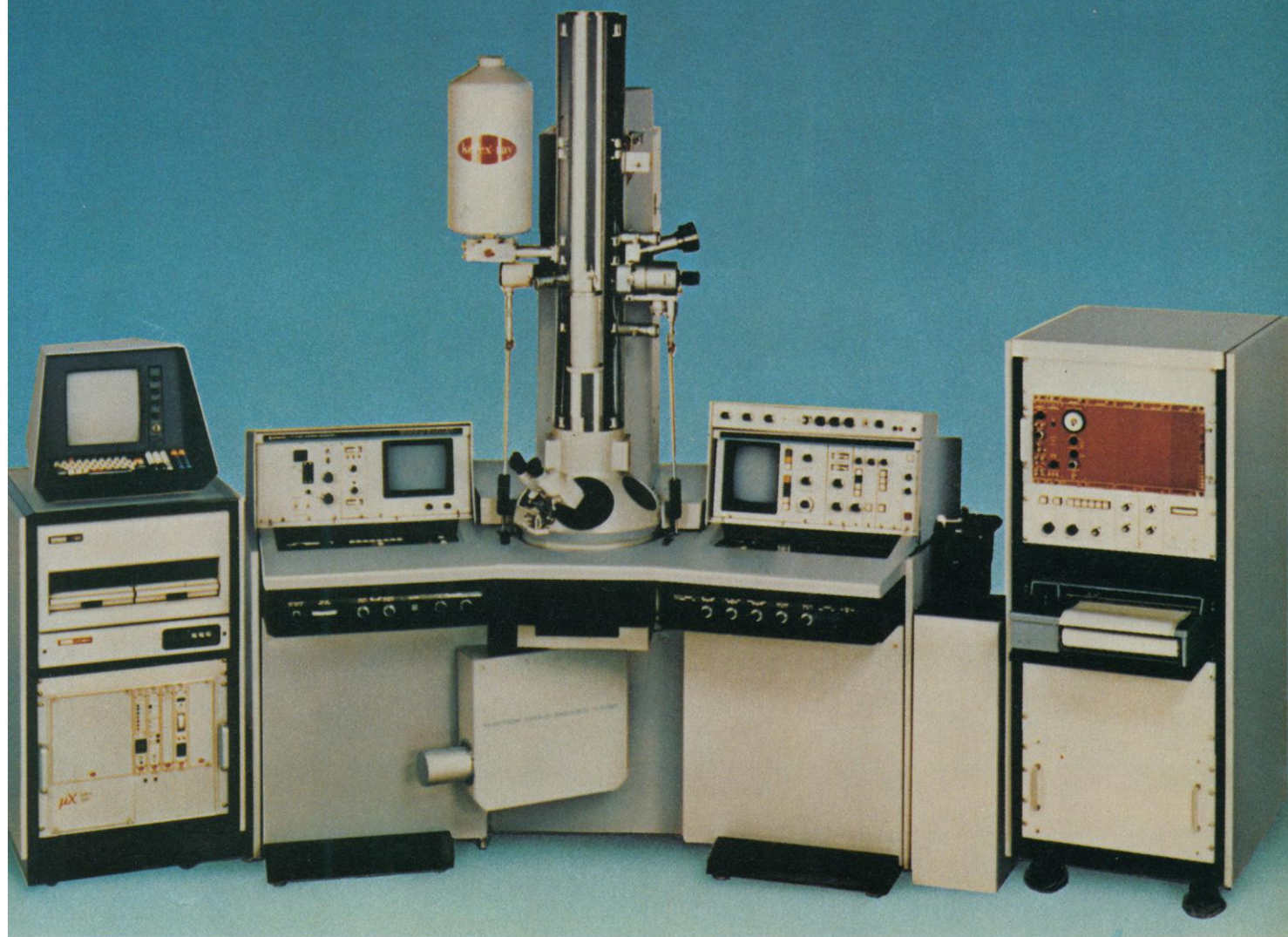
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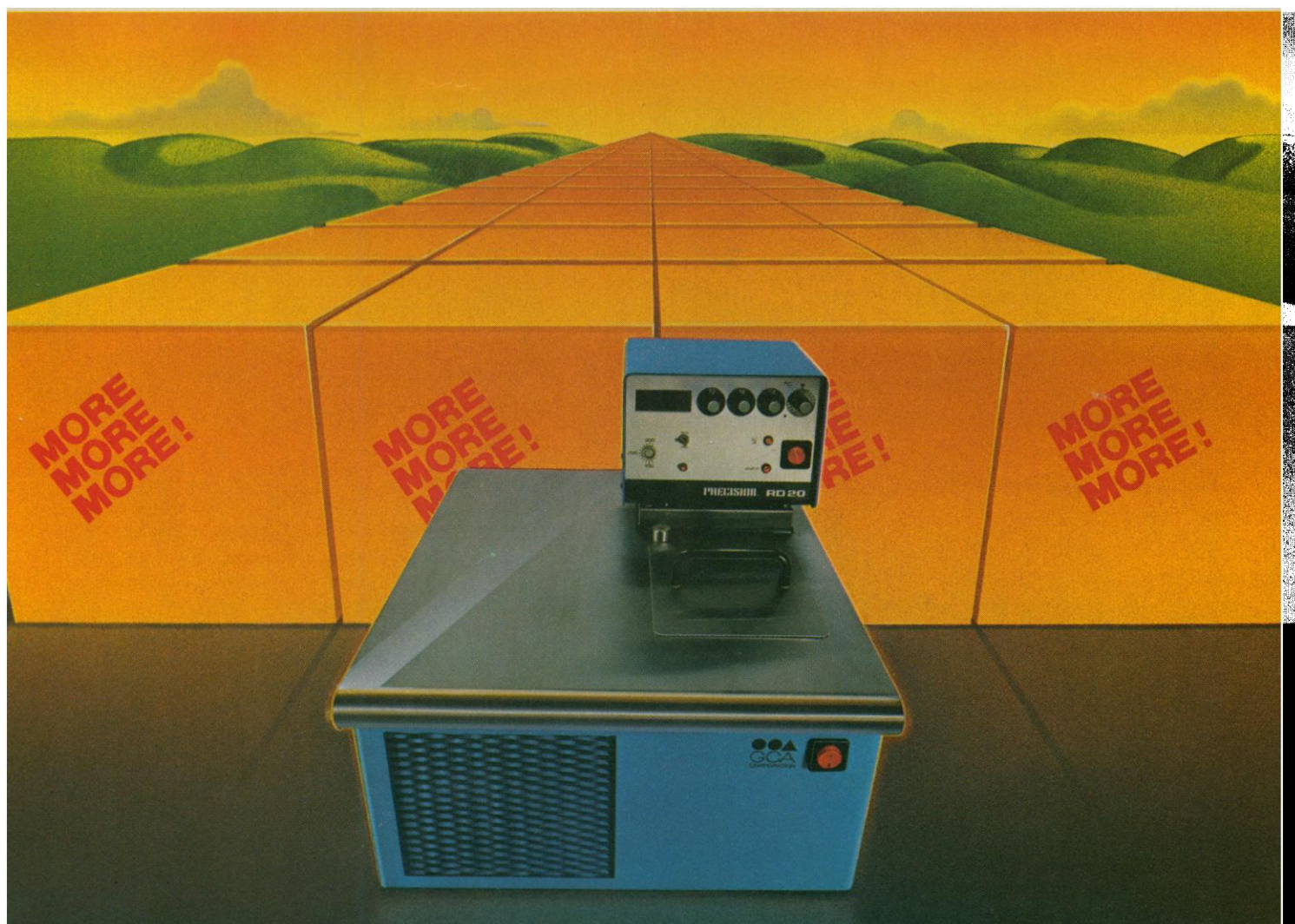
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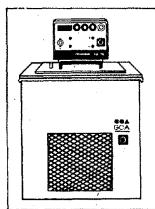


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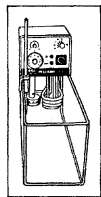
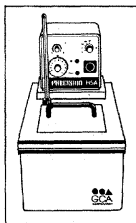
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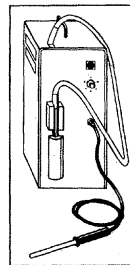
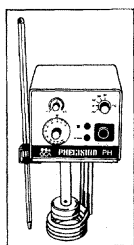
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LETTERS

Evolution and Prediction

In his recent News and Comment article (20 Mar., p. 1331) on the outcome of "Scopes II" in California, William J. Broad brings up the charge that somehow evolutionary theory is less "scientific" than, say, quantum mechanics. Seemingly a good piece of ammunition for creationists, the charge stems from Sir Karl Popper's characterization of "Darwinism" as a "metaphysical research program"—not a theory with falsifiable components. To assume, however, that "evolutionary theory . . . does not behave like a good theory" because "it is unable . . . to make predictions about future events" is to misconstrue the true nature of predictivity and hypothesis testing in science.

One must distinguish between the general notion that life has evolved and specific theories on *how* life evolves. Only the latter is conventionally called "evolutionary theory." If some evolutionary biologists have been less than rigorous in their adherence to the hypothetico-deductive approach to the study of evolutionary mechanisms, it is nonetheless true that the experimental procedures of geneticists and developmental biologists, and the field and laboratory procedures of ecologists, systematists, and paleontologists generally are firmly cast within the hypothetico-deductive mold (*1*). There is no problem with the study of evolutionary mechanics being "scientific" by Popper's or any other serious philosopher's conception of that term. The very "squabbles" among evolutionists said to show how weak the theory is actually show that rival hypotheses are once again being evaluated in evolutionary biology—an activity that is supposed to be normal in science.

But Popper's by now famous remark pertains as well to the very notion of evolution. How do we falsify the historical proposition that life has evolved? If evolution is "descent with modification," as Darwin so elegantly phrased it, a hierarchical array of organisms defined by nested sets of evolutionary novelties (modifications) *must* result. This is evolution's grand prediction: that all organisms descended from a common ancestor will display one coherent pattern of nested sets of resemblances. All forms of life have RNA, all eukaryotes discrete nuclei, all vertebrates backbones, and all mammals three inner ear bones. In addition to the properties unique to *Homo sapiens*, we also have general primate,

mammalian, vertebrate, and eukaryotic features. Follow any other branch of life and you find the same pattern: nested sets of biochemical, anatomical, and behavioral characteristics. Thus the basic prediction of evolution is confirmed, though this is not the point. In principle, were we to find no order, we would have to reject the notion of genealogical relationships among organisms: the notion of evolution.

Of course, creationists see the same order in the biotic world and simply claim that the Creator made it that way. But this "what you see is what you get" notion makes no predictions about the structure of similarities interlinking the biota. The reason why the pages of *Science* are open to those who look at the effects of caffeine on rats is that the efforts of systematists (who have been among Popper's more ardent admirers in the realm of biology) hinge on predictivity: the closer the phylogenetic relationship of an experimental animal to man, the more similar its physiology is *likely* to be, and hence the more forceful the implications of the results will be to human medicine. By all criteria, both aspects of evolutionary study—pattern and process—are as scientific as any activity I can think of. The creationists will not win in court on the trumped-up charge that evolution is "secular humanism" and not science. But they *may* win in the more important arena of public opinion if they succeed (as they have to a remarkable degree thus far) in convincing our fellow citizens that science is just another authoritarian belief system, and that Americans, in the traditional sense of "fair play," should be allowed to "hear both sides."

NILES ELDREDGE

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References and Notes

1. A more detailed consideration of the hypothetico-deductive method in evolutionary research can be found in N. Eldredge and J. Cracraft, *Phylogenetic Patterns and the Evolutionary Process* (Columbia Univ. Press, New York, 1980).

I give my compliments to William J. Broad for his recent News and Comment article on the evolutionist-creationist confrontation. His is the first article I have seen to point out that the principal issue at stake is one not of facts, but of philosophy. I believe, as Broad seems to suggest, that the philosophical question is how to distinguish between scientific and nonscientific methods of explanation. The creationists seem to under-

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stand this when they assert that evolutionary theory is religious or that creationist theory is scientific. With all due respect for biologist Arthur Kornberg, astronomer Carl Sagan, and biophysicist Thomas H. Jukes, the successful defense of science will probably depend on philosophers of science, as Broad proposes, and possibly also on historians of science.

ANTHONY B. WAY
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... If methodological problems and doctrinal disputes add up to an undercutting of evolutionary facts, as creationist attorney Richard K. Turner claims, what about the creationists? Leaving aside the progressive creationists, the day-age creationists, the gap-theory creationists, the pre-Genesis gap-theory creationists, and others (1), the 6-day creationists by themselves encompass a spectrum of views, some departing considerably from the literal Genesis account. Some of these have been summarized by Morris (2). One of the disagreements concerns the number and kind of miracles in the creation model, a topic discussed further by Lammerts (3). While Morris is in favor of playing down the role of miracles, Lammerts insists there are a great many. Certainly incorporating miracles into explanatory hypotheses qualifies as a methodological oddity in a discipline that calls itself scientific creationism!

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1. H. M. Morris, Ed., *Scientific Creationism* (Creation-Life, San Diego, Calif., 1974), pp. 220-243.
2. ———, *Creation Res. Soc. Q.* 11, 173 (1974).
3. W. E. Lammerts, *ibid.* 12, 75 (1975).

... The evolutionists seem to be allowing themselves to be boxed in by accepting definitions stipulated by the creationists. One might dispute these definitions by making the following four points:

1) The minimum necessary to make a doctrine religious is that it asserts the existence of at least one supernatural deity. Evolution is thus no religious doctrine and the establishment clause remains inviolate when schools mandate its teaching.

2) It is impossible to teach all the different views that may be held on any

point by different persons or groups. In any science it is appropriate to teach those views held by general consensus in the relevant competent scientific community, always provided that the views can be put in manageable form for students, and that the open-ended character of science is stressed.

3) There is no reason to hold that all theories properly described as scientific are predictive. A theory might well be oriented in one temporal direction for explanatory purposes, in this case the past, and still provide a scientific explanation in its domain. And if falsifiability were held to be the criterion for distinguishing scientific from nonscientific theories, it would not be too hard to devise tests for such a theory.

4) In any case, evolution can be considered a complex fact rather than a theory (1). What is in dispute among scientists is not the existence of the fact, but the mechanism through which evolution works.

BARRY R. GROSS
Department of Philosophy, York College, City University of New York, Jamaica, New York 11451

References

1. A. Montagu, *New York Times*, 17 March 1981, p. A16.

Same Name, Different Spelling

The 23 January issue of *Science* contains an article by R. Jeffrey Smith (News and Comment, p. 364) discussing the illegal transfer of sophisticated technology to the Eastern Bloc. On page 366 the author describes the activities of a certain Bryan Williamson, who is referred to as "a consulting engineer" "now with an electronics firm in England."

My name is Brian Williamson. Like the man in the article, I used to live in America and now live in England. I, also, am "a consulting engineer," and my company, Williamson Interface Ltd., is "an electronics firm in England." I earn my living consulting in the area of electrical and electronic engineering and have clients all over the world, especially in the United States. . . .

I know nothing of Bryan Williamson, and neither I nor any member of my firm has ever been engaged in the activities described in the article. . . .

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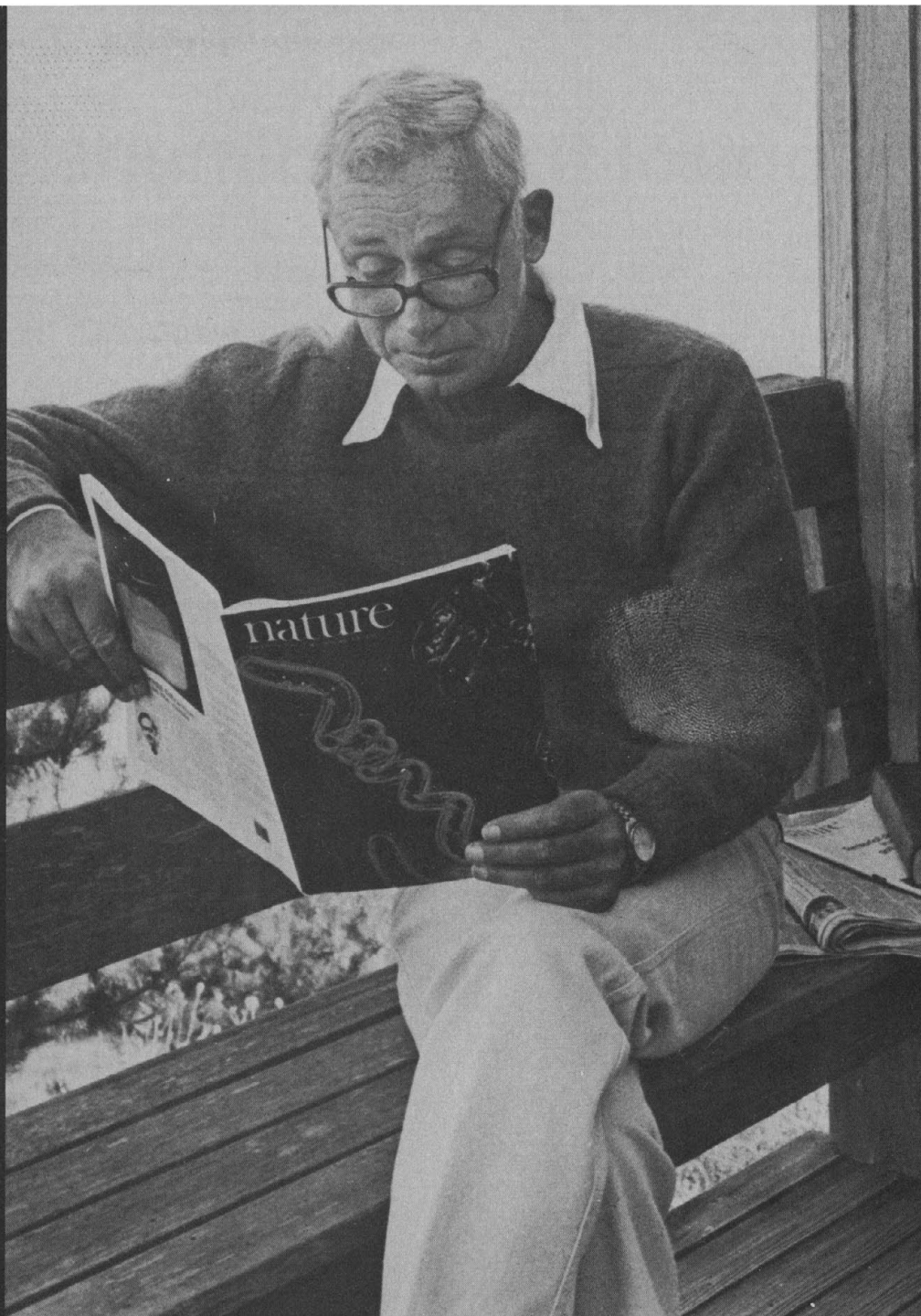
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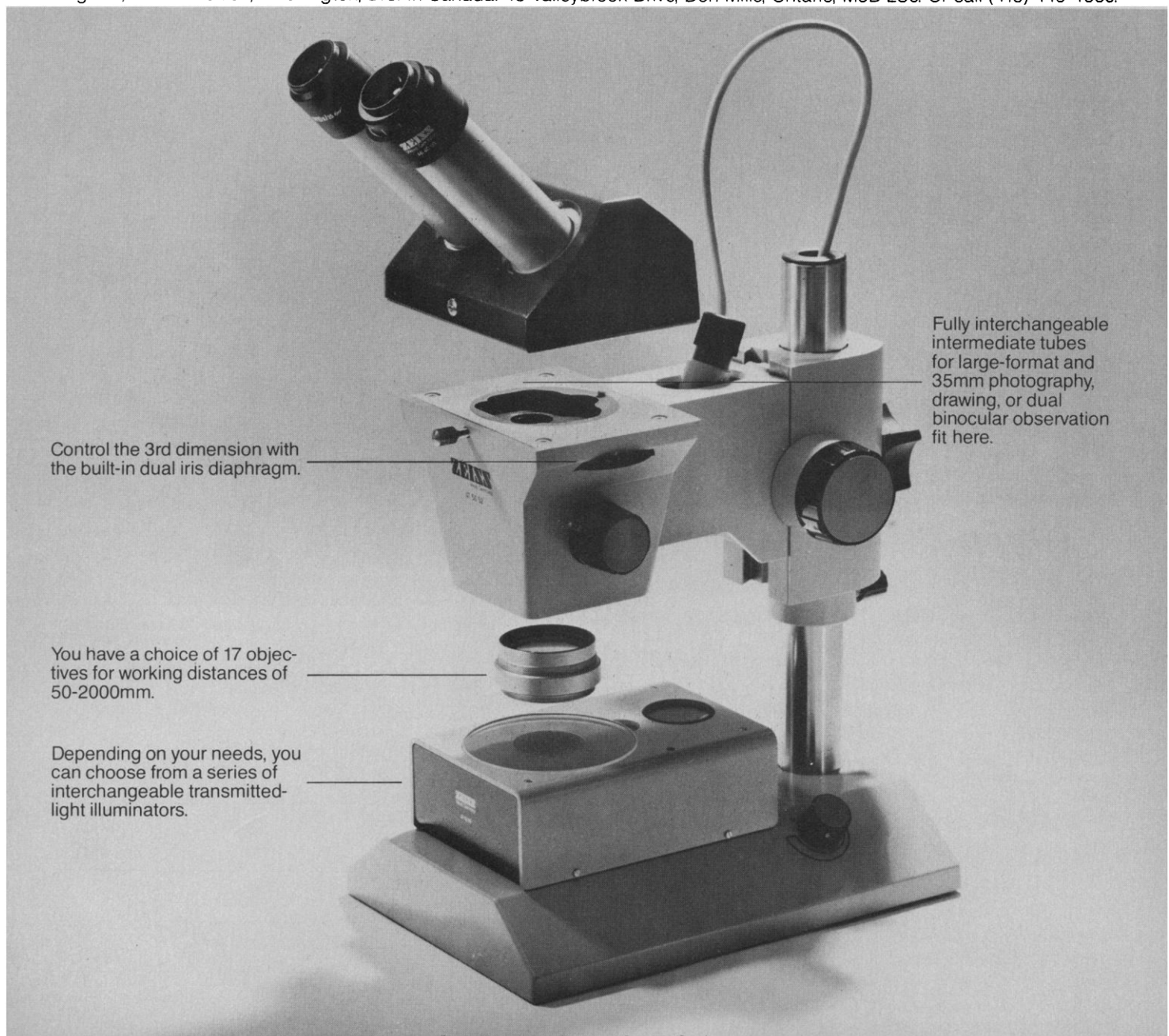
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Science Policy and Congress

Some institutional innovations pay off. That is something to rejoice about, especially when they involve the performance of government in a public opinion climate that has made up its mind to be negative.

The Technology Assessment Act of 1972, fathered by then-Representative Emilio Q. Daddario, called for the creation of a professionalized center for studying the potentialities and impacts of emerging technologies. The Office of Technology Assessment (OTA) was established as an arm of Congress, designed to provide new depth and expertise to the work of committees of the House and Senate in dealing with technological controversy and risk, and complementing the efforts of the Congressional Research Service and the General Accounting Office.

Eight years later, OTA stands on its own feet as an effective and respected center of scientific and technological policy analysis. Its agenda is determined primarily by the questions put to it by committees and subcommittees charged with legislative responsibilities, although OTA has modest latitude to initiate studies under its own power. Quality control is seen to by a ten-member advisory council and an array of credentialed advisory panels, while a bipartisan congressional board of 12 members of the Senate and the House keeps OTA on target.

The roster of advisory panels provides a glimpse of the range of OTA's homework for Congress. The panels number 47 and cover a mind-boggling spectrum. There are panels on Advanced High-Speed Aircraft, Radio Frequency Use, Space Technology, Electronic Funds Transfer, National Information Systems, Technology and Oceanography, Strategies for Medical Technology, Population, Impacts of Applied Genetics, U.S. Industrial Competitiveness, MX Missile Basing, Soviet Energy, Nuclear Powerplant Standardization, and Energy from Biological Processes. All this produces an enviable knowledge base into which the responsible committees of Congress can dip when confronted with near-term and long-range problems of policy choice. Considering that the appropriation for OTA comes to eight-tenths of 1 percent of the congressional operating budget, it would seem a modest enough investment in legislative capacity building.

A further point of interest is that there is no pretense that OTA is in business to make policy. This is a distinction better understood and practiced in Congress than in the Executive Branch, where presidential staff units come to believe that they are policy instruments of the President and behave accordingly. A very good reason for this difference is that Congress remains emphatically pluralistic and has nothing of the policy discipline that is so admired by the Executive Branch. An Office of Technology Assessment in Congress would not last long if it were to push a line of its own.

For most of our constitutional history, the Presidency has had the advantage over Congress in depth of resources for policy research and initiative. More recently, the institutional capacities of Congress have become steadily more comparable. The striking modernization of the General Accounting Office, the solid performance of the Congressional Research Service, and the impressive outputs of the Congressional Budget Office and OTA are healthy signs for all who value the principle of separation of powers. Although there are critics of the growth of the legislative payroll, Congress is aware that guess and hunch make for flawed policy.

Within the present decade we will observe the bicentennial of the Constitution, an occasion for some festivities, perhaps, but even more an occasion for examining the workings of our political technology in an age of danger and risk. Institutions in good working order reflect the better side of government.—WILLIAM D. CAREY

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rather than basic research is a pervasive theme. At least to this reader, the sections on insect pest control, infectious and parasitic diseases, plant breeding, and earthquake forecasting were particularly interesting. These areas exhibit Chinese ingenuity and offer immediate promise for mutually rewarding collaborative research. The descriptions of mathematics and physics are more sobering, reflecting the ravages of the Cultural Revolution.

The broad overview this book provides necessarily yields its major deficiency. It does not convey a fine-grained sense of the research process in China: the heroic bureaucratic battles which younger, innovative individual scientists or research teams encounter to obtain the funds, manpower, and equipment to carry out research in a system that rewards seniority and political reliability; the mundane but enormous constraints on research, such as unreliable electric supply, inadequate space, antiquated equipment, chronic shortage of necessary supplies, and so on; the complicated patterns of interaction between research institutes and university departments, their supervisory bodies, and government consumers; the personal rivalries and animosities that inhibit cooperation and spark competition in each field; the political games and favoritism in government allocation of foreign travel and external research opportunities, and the harmful effects of excessive secrecy. The book masterfully surveys science in China but does not greatly advance our understanding of the scientific craft or the sociology of science in the People's Republic. Now that CSCPRC has assessed the various disciplines in China, it would be well advised to sponsor studies on the various aspects of science policy in China. Without the intimate feel for how research projects are actually organized and carried out, outside observers will only imperfectly be able to assess China's absorptive capacity, its ability to sustain scientific and technological advance, or ways to enhance Sino-American cooperation.

Nonetheless, taken as a whole, *Science in Contemporary China* does illuminate the key issues. Prior to reading this volume I sensed that China faced considerable limitations in its ability to absorb foreign technology. The volume suggests that a highly differentiated analysis is appropriate. Much depends on the technology in question. In certain areas, such as the biological sciences, medicine, and certain divisions of engineering, the Western impact seems likely to be swift and extensive. Advances in metallurgy

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